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around Oniwa on the Northwestern Slope of
Mount Fuji? : Experiencing the Fascination
Again of a Tour of the Ochu-do Trail

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**Why Does a Larch Scrub Community Establish around Oniwa
on the Northwestern Slope of Mount Fuji?:
Experiencing the Fascination Again of a Tour of the *Ochu-do* Trail**

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Abstract

Mount Fuji is a relatively young mountain, which erupted intermittently until 1707. The tree limit on Mount Fuji is composed of larches (*Larix leptolepis*). The limit ranges from 1,400 to 2,900 meters in altitude, depending on the slope. Around Oniwa on the northwestern slope of Mount Fuji, a larch scrub community is scattered in patches, forming an island, where the tree line is 2,650 meters. All of the larches are severely deformed toward the northeast due to strong winds. Factors maintaining the larch scrub are examined referring to tree size and tree age. Tree size decreases rapidly above an altitude of 2,390 meters on the northwestern slope, where the forest limit is located. On this slope, we can observe both a group of trees showing a stronger tendency toward growth in terms of height and another group growth in terms of diameter. These growth patterns change depending on the altitude; that is, the higher the altitude, the greater the diameter, and the lower the altitude, the greater the height. On the other hand, the relationships between tree size and tree age show a tendency at lower altitudes of older trees having greater heights, and at higher altitudes of older trees having greater diameter, but not heights. These facts suggest that a larch scrub community forms by controlling exposure to the severe environment. This is also in accord with the observation of older trees having greater deformation. It is considered that embolism is a plausible cause controlling tree size, especially tree height, because frost action with severe transpiration frequently occurs on this slope. As a result, a scrub formation would be fixed. This explanation of the growth mechanism of the landscape around Oniwa on the northwestern part of the *Ochu-do* trail running along the side of Mount Fuji will assist eco- and geo-tourism development on the *Ochu-do*.

Key words : ecotone, larch, tree height, tree age, tree limit, Mount Fuji

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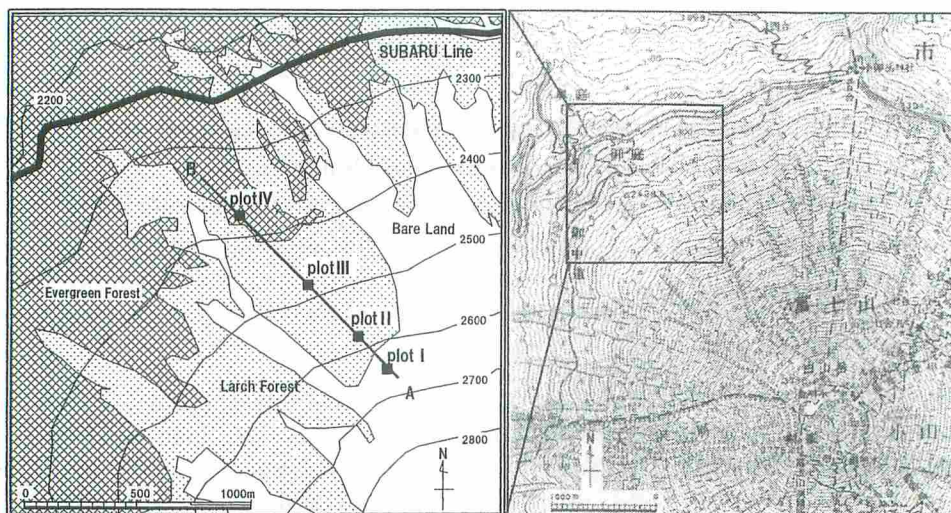


Fig. 1 Study area.

The summit of Mt. Fuji is situated at latitude 35°21'N and longitude 138°44'E (judged with a topographic map drawn to a scale of 1 to 50,000).

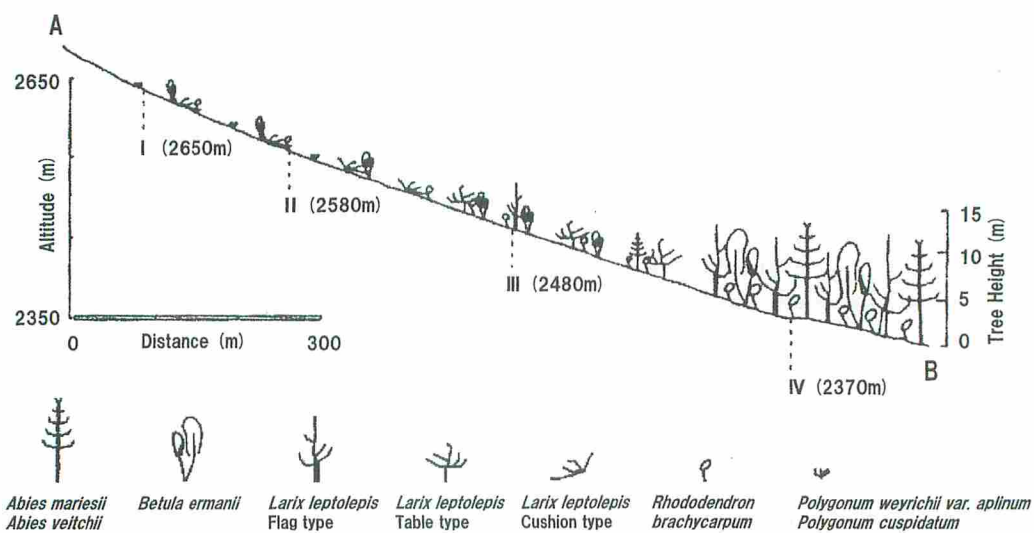


Fig. 2 Profile diagram along the northwestern slope of Mount Fuji.

Table 1 Results of survey based on quadrat method at each plot on the northwestern slope of Mount Fuji.

| | Tree Species | Height (m) | Number | RN (%) | Basal Area (cm ²) | RBA (%) | IV (RN + RBA) | Cover (%) |
|---------------------------------------|----------------------------------|---------------|--------|-----------|----------------------------------|------------|------------------|--------------|
| Plot I (12×12 m ²) | <i>Larix leptolepis</i> | 1.6 | 13 | 52 | 857 | 96 | 148 | 63 |
| Density (individuals/m ²) | <i>Betula ermanii</i> | 1.2 | 5 | 20 | 24 | 3 | 23 | 13 |
| 0.17 | <i>Sarix reinii</i> | 0.5 | 7 | 28 | 8 | 1 | 29 | 8 |
| | total | 2.2 | 25 | 100 | 889 | 100 | 200 | — |
| Plot II (10×10 m ²) | <i>Larix leptolepis</i> | 0.9 | 1 | 6 | 900 | 93 | 99 | 55 |
| Density (individuals/m ²) | <i>Betula ermanii</i> | 0.7 | 5 | 31 | 18 | 2 | 33 | 3 |
| 0.16 | <i>Rhododendron brachycarpum</i> | 0.5 | 8 | 50 | 41 | 4 | 54 | 4 |
| | <i>Sarix reinii</i> | 0.4 | 2 | 13 | 6 | 1 | 14 | 1 |
| | total | 1.1 | 16 | 100 | 958 | 100 | 200 | — |
| Plot III (10×10 m ²) | <i>Larix leptolepis</i> | 1.8 | 6 | 13 | 466 | 48 | 61 | 47 |
| Density (individuals/m ²) | <i>Betula ermanii</i> | 1.5 | 12 | 25 | 289 | 30 | 55 | 12 |
| 0.47 | <i>Rhododendron brachycarpum</i> | 0.7 | 22 | 48 | 191 | 20 | 68 | 8 |
| | <i>Sarix reinii</i> | 0.6 | 3 | 6 | 5 | 1 | 7 | 1 |
| | <i>Eubotryoides grayana</i> | 0.6 | 4 | 8 | 10 | 1 | 9 | 1 |
| | total | 2.1 | 47 | 100 | 961 | 100 | 200 | — |
| Plot IV (10×10 m ²) | <i>Abies veichii</i> | 4.7 | 9 | 16 | 635 | 19 | 35 | 18 |
| Density (individuals/m ²) | <i>Larix leptolepis</i> | 6.3 | 2 | 4 | 683 | 21 | 25 | 9 |
| 0.56 | <i>Betula ermanii</i> | 5.2 | 7 | 13 | 1261 | 39 | 52 | 56 |
| | <i>Alnus maximowiczii</i> | 3.9 | 3 | 5 | 651 | 20 | 25 | 40 |
| | <i>Rhododendron brachycarpum</i> | 0.9 | 35 | 62 | 35 | 1 | 63 | 30 |
| | total | 9 | 56 | 100 | 3265 | 100 | 200 | — |

RN: Relative number of individuals, RBA: Relative Basal area, IV: Importance value.

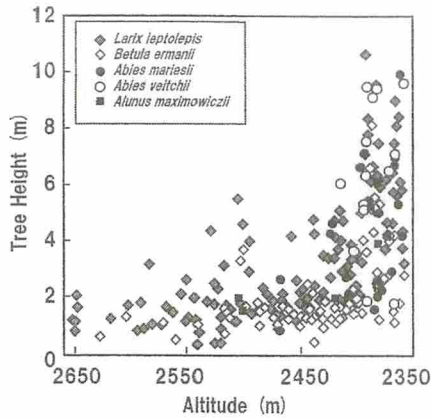


Fig. 3 Changes in tree height at different altitudes on the northwestern slope of Mount Fuji.

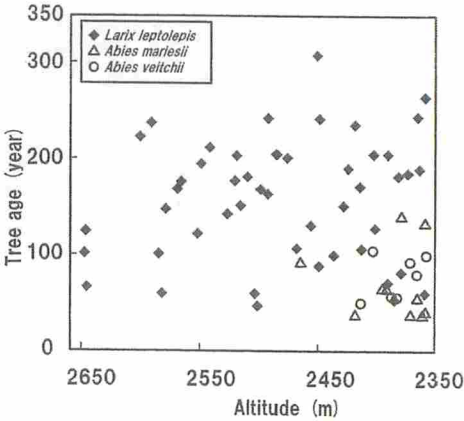


Fig. 4 Changes in tree age at different altitudes on the northwestern slope of Mount Fuji.

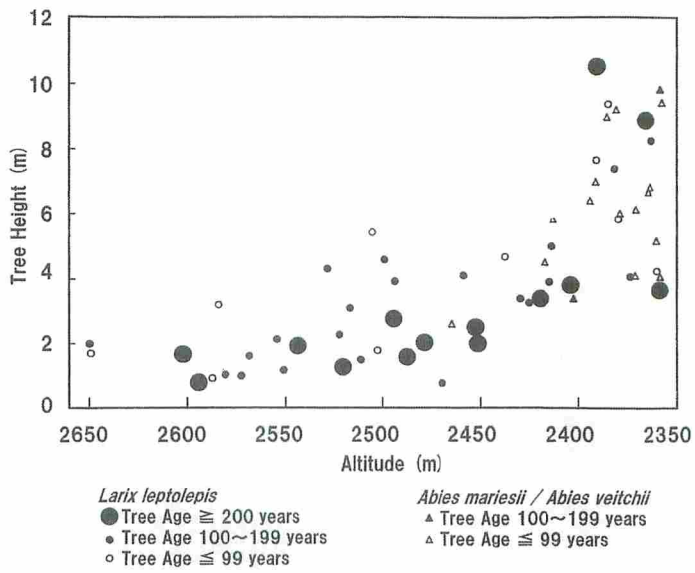


Fig. 5 Changes in tree height according to age class at different altitudes on the northwestern slope of Mount Fuji.

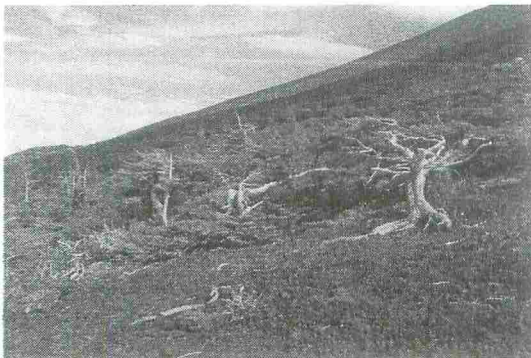


Fig. 6 Typical tree form at 2,500 m altitudinal point on the northwestern slope of Mount Fuji (taken by Oka, Sept. 2014).

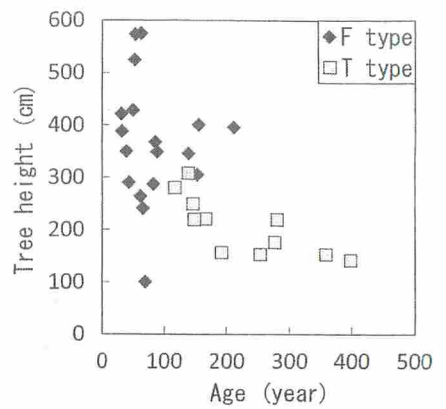


Fig. 7 Relationship between tree height and tree age in the 2,440–2,500 m altitudinal zone on the northwestern slope of Mount Fuji.
F type: flag-shaped tree, T type: table-shaped tree.

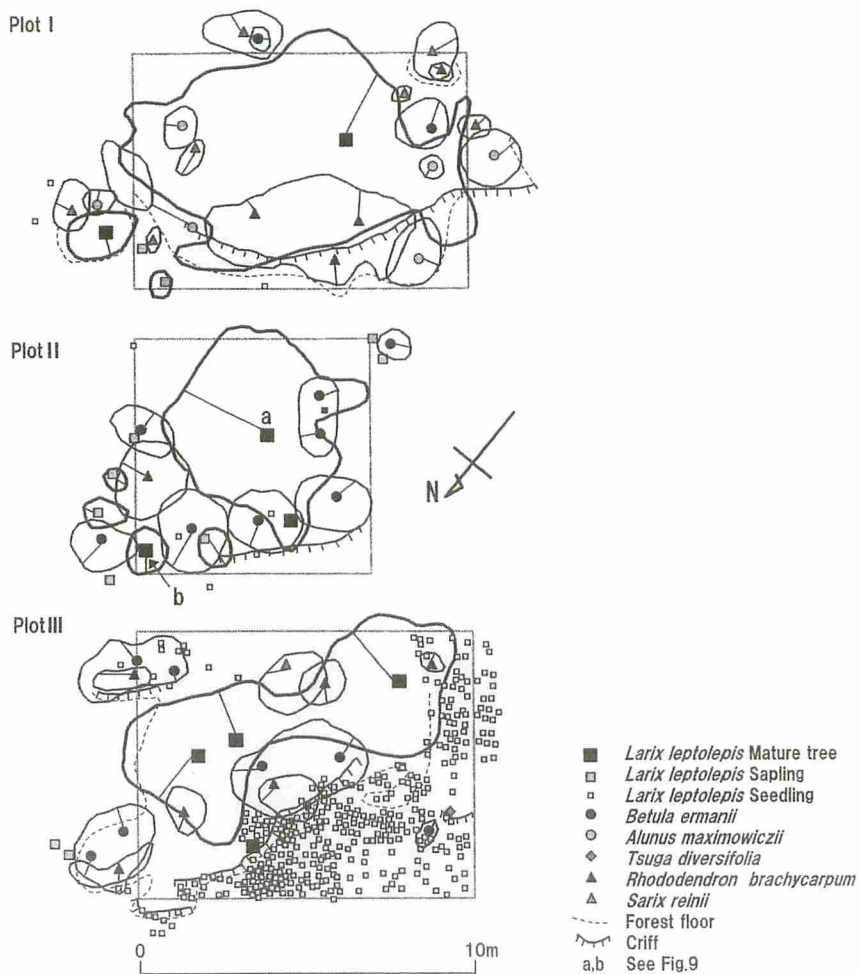


Fig. 8 Crown covers of patch community and distribution of seedlings around them on the northwestern slope of Mount Fuji.

Table 2 Seedlings of *Larix leptolepis*, *Abies veitchii*, and *A. mariesii* at Plot I, II, III.

| | No. of patch | Mean height of community (m) | Species | No. of seedling | | | No. of sapling | | |
|----------|--------------|------------------------------|-------------------------|-----------------|-----|------|----------------|-----|------|
| | | | | max | min | mean | max | min | mean |
| Plot I | 2 | 1.9 | <i>Larix leptolepis</i> | 7 | 4 | 5.5 | 6 | 2 | 4 |
| Plot II | 20 | 1.2 | <i>Larix leptolepis</i> | 26 | 0 | 9.8 | 30 | 0 | 4.3 |
| Plot III | 15 | 2.1 | <i>Larix leptolepis</i> | 400 | 5 | 84.4 | 19 | 0 | 3.9 |
| | | | <i>Abies veitchii</i> | 7 | 0 | 1 | — | — | — |
| | | | <i>Abies mariesii</i> | — | — | — | 3 | 0 | 0.2 |

seedling: (basal diameter < 1 cm), sapling: (basal diameter \geq 1 cm, < 5 cm).

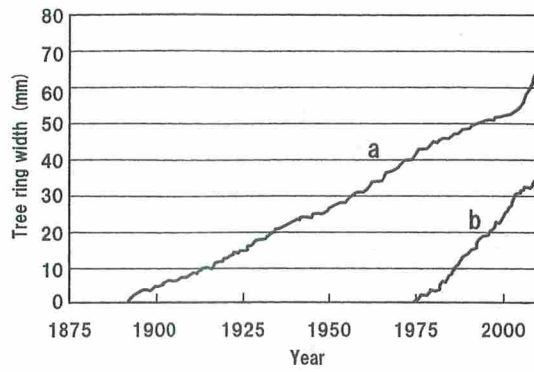


Fig. 9 Growth curves of two larch individuals at Plot II on the northwestern slope of Mount Fuji.



Fig. 10 Recruitment of larch individuals into ecotone on the northwestern slope of Mount Fuji (taken by Oka at 2,400 m point, Sept. 2014).

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